

REMARKS

In response to the Office Action mailed August 14, 2007, Applicant canceled claims 3, 15, and 16, amended claims 1, 6, 7, 9, 10, 13, and 17, and added claims 19 and 20. No new matter has been added. Claims 1, 2, 4-14, and 17-20 are presented for examination.

35 U.S.C. § 112

Claims 1-9 and 17 were rejected under 35 U.S.C. § 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which Applicant regards as the invention. Although the Applicant does not concede those claims were insufficiently clear, certain amendments have been made to claims 1, 6, 7, 9 and 17. Applicant has amended claim 1 so that the expression "cylinder of sleeve" now reads "cylinder or sleeve". In claims 6 and 7, the expression "as the metal" has been deleted as requested by the Examiner. Claim 9 is now dependent on claim 8. Claim 17 has been amended to include the phrase "when an entire molten charge in the cylinder or sleeve has been transferred from the cylinder or sleeve into said die or mould." In view of the foregoing amendments, Applicant respectfully requests reconsideration and withdrawal of the rejection of claims 1-9 and 17 under 35 U.S.C. § 112, second paragraph.

35 U.S.C. § 102 and § 103

Claims 1, 6, 7, and 8 were rejected under 35 U.S.C. § 102(b) as being anticipated by US 5,839,497 (Fujino et al.) (hereinafter "US '497"). Claims 2, 4, 5, 9-14, and 17-18 were rejected under 35 U.S.C. § 103(a) as obvious over US '497 alone or in combination with US 4,842,038 (Fujino et al.) (hereinafter "US '038").

Claim 1, as amended, includes the features of "a telescopic piston arrangement which elevates the cylinder or sleeve vertically displacing the cylinder or sleeve relative to a heating arrangement" and "heating the metal of the molten charge, after forming the molten charge, to raise the temperature of the molten charge, prior to filling the die or mould with the molten charge at the raised temperature." Claim 10, as amended, includes "a telescopic piston

arrangement for elevating the cylinder or sleeve relative to the heating arrangement" and "the cylinder or sleeve being relatively vertically displaceable relative to the heating arrangement."

US '497 fails to disclose or suggest a process or apparatus including vertically displacing the cylinder or sleeve relative to a heating arrangement (claims 1 and 10) and further heating the metal of the molten charge, after forming the molten charge (claim 1). Rather, US '497 discloses a vertical die casting method that includes "a casting cylinder 9 as well as [a] casting sleeve 7, [a] plunger tip 11, and the like [that] can be tilted by the operation of a tilting unit . . . to such positions that a ladle 17 can supply the melt to them . . ." (US '497, col. 8, lines 21-23; see also US '497's FIG. 1 reproduced below). "When the tilt state is canceled, the casting sleeve 7 is set vertical . . . and is pushed upward by the joining cylinders 10 through the joining frame 8 to be joined to the casting port 25 of the stationary mold 5." (US '497, col. 9, lines 36-39).

Accordingly, US '497 fails to disclose or suggest each and every feature of either claim 1 or claim 10.

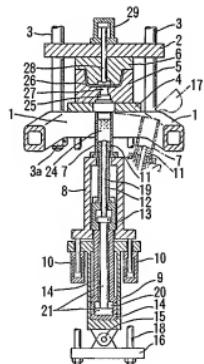
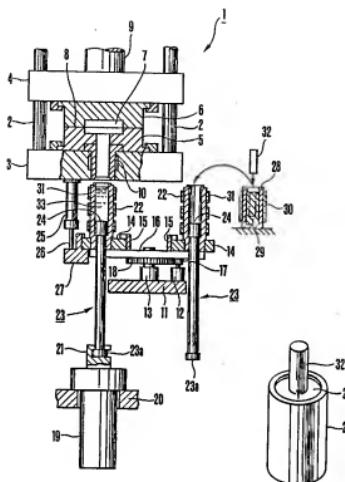


FIG. 1

Moreover, a person of ordinary skill in the art would not have modified US '497 to include a heating arrangement and a cylinder or sleeve relatively vertically displacing a cylinder or sleeve relative to the heating arrangement. US '497 discloses an injection casting system (as opposed to a melt injection system) and does not even consider heating the cylinder or sleeve.

Accordingly, US '497 is silent about the possibility of having a heating arrangement and a hollow cylinder or sleeve for the molten charge, which are relatively vertically displaceable to each other and clearly do not foresee any advantages that may arise out of such an arrangement. The process described in US '497 includes using joining cylinders 10 and joining frame 8 to push the casting sleeve 7 upward to be joined to the casting port 25 of the stationary mold 5. (See, e.g., US '497, col. 9, lines 35-39). Allowing vertical displacement of US '497's casting sleeve 7 relative to a heating arrangement would require, for example, a substantial reconstruction and redesign of the joining cylinders 10 and joining frame 8 in US '497 as well as a change in the basic principle under which the casting sleeve 7 is joined to the casting port 25. Accordingly, a person of ordinary skill in the art would not have modified US '497 to include vertically displacing a cylinder or sleeve relative to a heating arrangement, as required in claims 1 and claim 10.

US '038 does not remedy the deficiencies of US '497. US '038 describes a die casting method including heating a billet 29 in a preheater 28 until a central portion of the billet 29 is melted (See, e.g., id., col.3, lines 14-32; see also FIGS. 1 and 2 of US '038 below). The billet 29 is then carried into an injection sleeve 22 and heated in the sleeve 22 by corresponding heaters 31 to obtain a molten metal 33. (See, e.g., id., col. 3, lines 32-35). Prior to injecting molten metal 33 into cavity 7, a piston rod 26 moves the sleeve table 14 and the attached injection sleeve 22 and corresponding heater 31 upward to urge the injection sleeve 22 tightly against and connected to the stationary sleeve 10. (See, e.g., id., col. 3, lines 58-62). Furthermore, the '038 patent does not disclose heating the metal of the molten charge, after forming the molten charge, to raise the temperature of the molten charge. It is quite clear from the '038 patent that the molten charge is injected as soon as it is molten (see for example column 3 lines 32 to 39, column 3 lines 48 to 67, column 4 lines 8 to 12, column 4 lines 58 to 68, column 5 lines 5 to 11, column 6 line 29 to 34, etc.). US '038 does not disclose or suggest vertically displacing a cylinder or sleeve relative to a heating arrangement, as required by claims 1 and 10, or further heating the metal of the molten charge, after forming the molten charge, as required by claim 1. For at least these reasons, US '038 fails to cure the deficiencies of US '497.



F I G. 1

F I G. 2

Furthermore, the features distinguishing claims 1 and 10 from US '497 and US '038 are not trivial. For example, in the apparatus and process of claims 1 and 10, solidification of the molten charge above the piston is reduced and it is easy to generate a desired temperature profile in the molten charge inside the cylinder or sleeve, by virtue of the fact that the heating arrangement and the cylinder or sleeve are relatively vertically adjustable. By way of example, it has been observed that the process and apparatus of the present invention can cast magnesium (which is more difficult to cast than aluminum) motor vehicle wheel rims from a billet, with the temperature profile in the molten charge in the cylinder or sleeve being controlled such that a top portion of the molten charge is desirably hotter, but no more than 5°C hotter, than a bottom portion of the molten charge and with the entire molten charge within about 5°C of the desired injection temperature.

An invention which is defined as the combination of original claims 1 and 3 is thus not obvious, contrary to the assertion by the Examiner to this effect. It is well-settled that in order to establish a *prima facie* case of obviousness, the Examiner bears the burden, *inter alia*, of showing that every element of the claimed invention is disclosed or suggested by the combination of the '038 and the '497 patents. MPEP § 2142. This has not been done. As the Applicant is desirous of expediting this application, the further limitation of "vertically displacing the cylinder or sleeve relative to a heating arrangement" (claim 1) and "the cylinder or sleeve being relatively vertically displaceable relative to the heating arrangement" (claim 10) have been added. None of the prior art documents of record discloses or suggests heating the metal of the molten charge, after forming the molten charge, to raise the temperature of the molten charge, as claimed in claim 1. None of the prior art documents of record teaches or even suggests a cylinder or sleeve and a heating arrangement which are relatively vertically displaceable as claimed in claims 1 and 10. Thus, the Applicant submits that claims 1 and 10 are clearly patentable.

The Applicant has found that, in practice, the ability to displace the heating arrangement and the cylinder or sleeve vertically relative to each other (e.g. by means of the concentric barrels 37 and 35 as described in the specification), is important for controlling the heating of the molten charge in the cylinder or sleeve, prior to filling the die or mould with the molten charge. The process and apparatus of the invention are particularly suitable for casting aluminium artefacts and more particularly magnesium artefacts and the Applicant has come to the realisation that the control of the vertical temperature profile of the molten charge, prior to filling the die or mould with the molten charge, is very important for the quality of the cast article. The ability to adjust the vertical position of the heating arrangement relative to the cylinder or sleeve allows accurate temperature profiling of the molten charge in the cylinder or sleeve. None of the prior art documents of record describes or even suggests the desirability of temperature profiling of the molten charge in the cylinder or sleeve and none provides a heating arrangement which is vertically relatively displaceable to the cylinder or sleeve to assist in establishing a desired vertical temperature profile in the molten charge in the cylinder or sleeve.

In view of the foregoing discussion, Applicant requests reconsideration and withdrawal of the rejection of claims 1, 6, 7, and 8 as being anticipated by US '497 and the rejections of claims 2, 4, 5, 9-14, and 17-18 as obvious over US '497 alone or in combination with US '038.

Provisional Rejection for Double Patenting

Claims 1-14 and 17-18 were provisionally rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claims 1-19 of copending Application No. 10/596,017. The Applicant requests that this rejection be held in abeyance until the claims are otherwise in condition for allowance.

New Claims

The Applicant added new claims 19 and 20 directed to the discardable cylinder or sleeve. Claims 19 and 20 depend from claims 1 and 10, respectively, and are allowable for at least the reasons discussed above. Further work by the Applicant has demonstrated that the one shot casting from discardable cylinders or sleeves possible with the process and apparatus of the present invention, is of great significance in achieving a superior cast product, especially when aluminum or magnesium alloys are used. Not having to rely on a sleeve comprising a detachable injection sleeve 22 and a large stationery sleeve 10 as shown in US '038 or a similar arrangement of a detachable casting sleeve 7 and a large gate zone 27 as shown by US '497, avoids cross contamination of metals between casting operations caused by metal residues in the stationery sleeve 10 and the gate zone 27 of the prior art documents. The fact that the cylinder or sleeve of the present invention as claimed in claims 19 and 20 is discardable, and can thus be used for single shots, provides the same advantage. As will be appreciated, the unitary discardable sleeve of claims 19 and 20 thus reduces metal contamination in two ways. In contrast, with the prior art apparatus, the sleeves are used repeatedly and will score, simply adding to the contamination problem caused by reliance on large stationary zones 7 and 27. In US '497, the casting sleeve 7 is clearly not free standing on the peripheral piston but instead a joining frame is formed integral with the casting sleeve 7 (see column 8, lines 10 and 11). In US '038, the injection sleeves 22

are fitted in central holes of the sleeve tables 14. It is not clear from US '038 whether or not the injection sleeves 22 can be considered to be free standing. In any event, the injection sleeves 22 do not have a hollow cylindrical interior of constant diameter and the central piston cannot enter a sleeve 22 from below when the sleeve 22 is placed or mounted on a sleeve table 14. Instead, the injection plungers 23 are permanently locked to the injection sleeves 22, with their plunger tips 24 being prevented from withdrawing from the injection sleeves 22 by the narrowing of the interior of the injection sleeves 22 at their lower ends. As will be appreciated, the invention feature of claims 19 and 20 that the central piston enters the cylinder or sleeve from below when placing the new cylinder or sleeve on the peripheral piston is important if a sleeve is to be discardable, as it allows easy placing and removal of a sleeve for each casting operation. Clearly, the entire construction approach used for the apparatus of US '497 and US '038 is incompatible with use of a discardable sleeve. In US '038, the injection sleeve 22 even has heaters 30 mounted on their outer surfaces. It is thus respectfully submitted that the features of new claims 19 and 20 are not taught or even suggested by the prior art of record, and that these features are thus also clearly patentable, in combination with the features of claims 1 and 10 respectively.

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The \$1050 fee for the three-month extension of time is being paid concurrently herewith on the Electronic Filing System (EFS) by way of deposit account authorization. Please apply any other charges or credits to Deposit Account No. 06-1050, referencing Attorney Docket No. 20997-002US1.

Respectfully submitted,

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